

## **El Camino College**

### **COURSE OUTLINE OF RECORD - Official**

#### I. GENERAL COURSE INFORMATION

Subject and Number: Descriptive Title:	Astronomy 20 The Solar System
Course Disciplines:	Physics/Astronomy
Division:	Natural Sciences
Catalog Description:	This course is an introduction to the major planets and the smaller members of the solar system such as moons, asteroids, Kuiper Belt Objects, and comets. Theories of the origin and histories of the planets are presented. The early history of astronomy and the Copernican Revolution are discussed. Sky phenomena such as constellations, the seasons, eclipses, and planetary motions are demonstrated in the planetarium. The possibility of life elsewhere in the solar system is examined.

### Conditions of Enrollment: Recommended Preparation

English 84

Course Length: Hours Lecture: Hours Laboratory: Course Units:	X Full Term Other (Sp 3.00 hours per week TB 0 hours per week TBA 3.00	becify number of weeks): A
Grading Method: Credit Status	Letter Associate Degree Credit	
Transfer CSU: Transfer UC:	<ul><li>X Effective Date: Prior to</li><li>X Effective Date: Prior to</li></ul>	o July 1992 o July 1992
General Education:		
El Camino College:	1 – Natural Sciences	
	Term:	Other: Approved
CSU GE:	B1 - Physical Science	
	Term:	Other: Approved
IGETC:	5A - Physical Science without	it Lab

#### **II. OUTCOMES AND OBJECTIVES**

A. COURSE STUDENT LEARNING OUTCOMES (The course student learning outcomes are listed below, along with a representative assessment method for each. Student learning outcomes are not subject to review, revision or approval by the College Curriculum Committee)

1. Students will be able to recognize the elements of the Scientific Method in the discussion of a scientific problem.

Students will be able to explain the causes of seasonal variations in the length of

2. the day, direction of sunrise and sunset, and the amount of solar heating on the Earth.

Students will be able to

3. describe the modern theory of the origin of the planets and

discuss the evidence that supports the theory.

The above SLOs were the most recent available SLOs at the time of course review. For the most current SLO statements, visit the El Camino College SLO webpage at <a href="http://www.elcamino.edu/academics/slo/">http://www.elcamino.edu/academics/slo/</a>.

# B. Course Student Learning Objectives (The major learning objective for students enrolled in this course are listed below, along with a representative assessment method for each)

1. Judge whether a particular study is science or a "pseudo-science" using the scientific method.

Homework Problems

2. Predict the phase of the Moon and/or type of eclipse that would be seen in the sky, given the positions of the Earth, the Sun, the Moon, and the observer.

Homework Problems

3. Explain the causes of seasonal variations in the length of the day, the direction of sunrise and sunset, and the amount of solar heating.

Objective Exams

4. Discuss the Copernican Revolution and the contributions of Galileo, Kepler, and Newton, including the Law of Gravity.

Essay exams

5. Compare the characteristics of the major planets and major moons of the Solar System.

Objective Exams

6. Estimate the age of the solar system, given data on the isotopic composition of meteorites.

Objective Exams

7. Construct a history of a planet in terms of the processes of impact, volcanism, tectonics, and erosion.

Essay exams

8. Describe the composition and properties of planetary atmospheres. Contrast the conditions on planets with atmospheres with the conditions on airless worlds. Compare the climatic conditions on the inner planets.

**Objective Exams** 

9. Compare and contrast the terrestrial, gas giant, and ice giant planets.

Essay exams

10. Evaluate the possibilities for life on a given planet.

Essay exams

11. Diagram how the planets were formed.

Essay exams

12. Describe how the greenhouse effect warms the surface of a planet.

Essay exams

## III. OUTLINE OF SUBJECT MATTER (Topics are detailed enough to enable a qualified instructor to determine the major areas that should be covered as well as ensure consistency from instructor to instructor and semester to semester.)

Lecture or Lab	Approximate Hours	Topic Number	Major Topic
Lecture	6	I	Overview of the Universe and the Scientific Method A. The Solar System B. The Universe C. The Scientific Method
Lecture	7.5	II	Sky Phenomena A. The Celestial Sphere and Constellations B. The Seasons C. Eclipses and Phases of the Moon D. Planetary Motions
Lecture	3	III	Ancient Astronomy A. The Origins of Western Astronomy B. The Geocentric and Heliocentric Models of the Solar System
Lecture	6	IV	The Copernican Revolution A. Copernicus B. Galileo C. Tycho Brahe D. Kepler E. Newton
Lecture	7.5	V	Gravity A. The Law of Inertia B. Acceleration Due to Gravity C. Orbital Motion D. The Law of Gravity E. Surface Gravity F. Escape Speed G. The Tidal Force
Lecture	3	VI	Electromagnetic Radiation A. The Electromagnetic Spectrum B. Creating Light C. Detecting Light
Lecture	3	VII	The Solar System A. Layout of the Solar System 1. Orbits 2. Rotation B. Properties of Planets

			<ol> <li>Size</li> <li>Mass and Density</li> <li>Magnetic Fields</li> <li>Rotation</li> <li>Classification of the Planets</li> <li>Age of the Solar System</li> <li>Relative Age Dating using Surface Features</li> <li>Dating of Igneous Rocks and Meteorites using Radio-active Isotopes</li> <li>Origin of the Solar System</li> <li>The Possibility of Life in the Solar System</li> </ol>
Lecture	9	VIII	The Terrestrial Planets and the Moon A. Structure 1. 4-Layer Structure 2. Density B. Surface Processes 1. Impact Cratering: Crater Morphology 2. Volcanism: Types of Volcanos 3. Erosion: Landslides, Wind, Water, Ice 4. Tectonics: Plate Tectonics on Earth C. Atmospheres 1. Composition 2. Properties 3. Greenhouse Effect 4. Carbon Dioxide Cycle-Stabilizing Effect on Climate D. The Moon E. Mercury F. Venus G. Mars: Past and Present H. The Earth
Lecture	6	IX	The Outer Planets and their Moons A. Jupiter and Saturn B. Ring Systems and the Roche Limit C. Uranus and Neptune D. Galilean Satellite System: Role of Tides in their Evolution E. Titan: Primordial Atmosphere F. Triton: Capture and Eventual Tidal Destruction
Lecture	3	X	Smaller Solar System members A. Meteors, Meteoroids, and Meteorites B. Asteroids or Minor Planets C. Kuiper Belt Objects 1. Pluto and Charon D. Oort Cloud Comets E. Impacts and Their Role in the History of the Earth
Total	Lecture Hours	54	·
Total La	Total Laboratory Hours		
	Total Hours	54	

#### IV. PRIMARY METHOD OF EVALUATION AND SAMPLE ASSIGNMENTS

#### A. PRIMARY METHOD OF EVALUATION:

Problem solving demonstrations (computational or non-computational)

#### B. TYPICAL ASSIGNMENT USING PRIMARY METHOD OF EVALUATION:

Figure 1 shows a comet traveling in an elliptical orbit around the Sun. The comet is shown as it moves through four different segments of its orbit (labeled A, B, C, and D). During each segment of the orbit the comet sweeps out the triangular shaped area shaded in gray. Assume each of the shaded triangular shaped areas has the same size (area).

Rank the time it took (from greatest to least) for the comet to move along each of the segments (A–D) of the orbit.

Ranking order: Greatest 1\_\_\_\_ 2\_\_\_ 3\_\_\_ 4\_\_\_ Least

Or, the time to travel each segment would be the same. \_\_\_\_\_ (indicate with a check mark).

In a short paragraph, carefully explain your reasoning for ranking this way.

#### C. COLLEGE-LEVEL CRITICAL THINKING ASSIGNMENTS:

- Make a table showing which of the 4 planetary surface-shaping processes has occurred in each of the planets (Mercury to Neptune). With the use of photos, show examples of one process on each planet. For each planet, tell why the "missing" processes did not occur there, or have not been found there.
- 2. In a paragraph, explain why the seasons are opposite in the southern hemisphere.

#### D. OTHER TYPICAL ASSESSMENT AND EVALUATION METHODS:

Essay exams Other exams Quizzes Homework Problems Term or other papers Multiple Choice Completion Matching Items True/False Other (specify): short answers, drawing diagrams

#### **V. INSTRUCTIONAL METHODS**

Demonstration Discussion Group Activities Lecture Multimedia presentations Other (please specify) Planetarium demonstrations or interactive computer demonstrations, activities

with models

Note: In compliance with Board Policies 1600 and 3410, Title 5 California Code of Regulations, the Rehabilitation Act of 1973, and Sections 504 and 508 of the Americans with Disabilities Act, instruction delivery shall provide access, full inclusion, and effective communication for students with disabilities.

#### **VI. WORK OUTSIDE OF CLASS**

Study Required reading Problem solving activities Written work Other (specify) sky observations

Estimated Independent Study Hours per Week: 6

#### **VII. TEXTS AND MATERIALS**

- A. UP-TO-DATE REPRESENTATIVE TEXTBOOKS Chaisson and MacMillan. <u>ASTRONOMY TODAY</u>. 8th ed. Pearson Addison Wesley, 2013.
- B. ALTERNATIVE TEXTBOOKS Bennett el al.. <u>Cosmic Perspective</u>. 7th ed. Pearson, 2013.

#### C. REQUIRED SUPPLEMENTARY READINGS

#### D. OTHER REQUIRED MATERIALS

#### VIII. CONDITIONS OF ENROLLMENT

Α.

#### Requisites (Course and Non-Course Prerequisites and Corequisites)

Requisites	Category and Justification			
B. Requisite Skil	ls			
Requisite Skills				

#### C. Recommended Preparations (Course and Non-Course)

Recommended Preparation	Category and Justification
Non-Course	Students in this course are required to use critical thinking skills to read

Recommended Preparation	college-level textbooks. The skills developed in English 82 (or equivalent) will increase their ability to complete these assignments and will greatly enhance
	their chances for success in this course
English 84	

#### D. Recommended Skills

Recommended Skills Ability to read a college-level textbook. ENGL 84 -Select and employ reading strategies to interpret the content of a college-level textbook, with special focus on constructing a thesis statement and providing valid support. ENGL 84 -Identify an implied main idea (thesis), and support with major and minor details, from a longer text or novel.

#### E. Enrollment Limitations

Enrollment Limitations and Category	Enrollment Limitations Impact

#### Course created by Bruce Ftizpatrick on 11/01/1985.

#### **BOARD APPROVAL DATE:**

#### LAST BOARD APPROVAL DATE:

#### Last Reviewed and/or Revised by Stephen Lloyd on 01/23/2015

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